Title: Portable Personal Watercraft

FIELD OF THE INVENTION

This invention relates generally to marine craft and more particularly to an extremely lightweight, easily transportable highly maneuverable personal watercraft for recreational and other boating purposes.

BACKGROUND OF THE INVENTION

Recreational boating has become very popular, not only in the United States, but throughout the world. Most small size personal watercraft are of a size and weight requiring a trailer to transport them to and from the launch site. Depending upon an individual's lifestyle and living accommodations, the use of a trailer may be precluded. For example, apartment dwellers in many locations do not have the space available to them for storing a boat and trailer when not in use.

Other types of recreational boats include the canoe. While a canoe may be transported atop the roof of an automobile, such a watercraft must be paddled, although it is also possible to power a canoe with an outboard motor of some type. A further drawback of the canoe is that it is relatively slow and unmaneuverable and may be somewhat prone to tipping.

SUMMARY OF THE INVENTION

In accordance with the instant invention, an improved personal watercraft for recreational and utilitarian purposes is provided. The watercraft may have one or more of the following features and advantages.

In accordance with one embodiment of this invention a personal watercraft is constructed to enable it to be readily collapsed. The collapsed watercraft may then be manually carried and easily transported in the trunk of an automobile and without the need for a trailer. Preferably, the watercraft has one or more inflatable sections to permit it to be collapsed.

In accordance with another embodiment of this invention a pump is provided to inflate and/or deflate the inflatable sections of the craft. Preferably, the pump is provided as part of the watercraft. More preferably, the pump is in air flow communication with the inflatable sections such that at the press of a button it may be actuated to inflate and/or deflate the watercraft thereby making the packing and unpacking of the craft simple, convenient, and quick.

In accordance with another embodiment of this invention the watercraft has a central rigid core in which the battery is stored. Alternately, or in addition, the deflated craft can quickly be folded for storage in the rigid core. This rigid core may also incorporate wheels that are exposed when the craft is deflated or which are inflated when the craft is deflated to facilitate transportation to and from the waterfront. Alternately, or in addition, the motor and propeller or impeller unit can also be translated vertically into this rigid section for driving the unit to shore and for storage and transportation.

In accordance with another embodiment of this invention a means to mechanically and electrically connect an electrically actuated or manually actuated anchor to the central rigid core is provided.

In accordance with another embodiment of this invention a seating area comprised of one or more, and preferably several, layers of inflatable material (e.g. air impermeable fabric, plastic, rubber or the like) are provided to allow the seating position to be raised or effectively moved forward to allow smaller riders complete access to the controls.

In accordance with another embodiment of this invention armrests are provided. The armrests can be optionally inflated to provide more comfortable seating.

In accordance with another embodiment of this invention telescoping handles and handles that can bend 90 degrees to accommodate the comfort of different riders are provided for steering the watercraft.

In accordance with another embodiment of this invention a marine craft that is small in size, light in weight, very stable in water and extremely maneuverable uses a single centrally located steering control mechanism. Preferably, the steering control mechanism incorporates a trim control. Alternately, or in addition, the steering control mechanism incorporates a mechanically linked rudder which augments the turning forces produced by the rotation of the motor and propeller or impeller unit thereby allowing a small motion in the steering to create a significant change in direction. This augmented rudder allows steering of the craft at very low thrust levels.

In accordance with another embodiment of this invention the drive system for this marine craft comprises a safety cage that is constructed to reduce the chance for damage to the propeller or impeller due to contact with rocks or the lake bottom and reduces the danger for swimmers or wildlife which might otherwise come into contact with the propeller or impeller. The safety cage may comprise an open web about the impeller or propeller. Alternately, it may comprise a solid section with an inlet and an outlet wherein the inlet and outlet are constructed to prevent a person from reaching inside (such as by providing a mesh cover to the inlet and the outlet or by sizing the inlet and outlet to prevent a person from reaching inside.

In accordance with another embodiment of this invention the water hull that is in contact with the water is configured to minimizes the surface area and hence the drag to the system and maximize the available speed by providing a long contact line between the water while a secondary hull above provides the room necessary for the comfort and safety of the rider and any accessories the rider may desire.

In accordance with another embodiment of this invention the water hull comprises one, two or more water hulls having a narrow width, a long length, and a gentle lead in as a classic kayak wherein the water hull is an inflatable member or is an inflatable core with a durable outer surface,

such as hard plastic or fiberglass, affixed thereto or formed integrally therewith or coated thereon in contact with the water.

In accordance with another embodiment of this invention the water hull comprises one, two or more water hulls having a narrow width, a long length, and a gentle lead in as a classic kayak but which are narrower than a classic kayak as the riders body is supported above the water hull wherein the water hull is constructed to receive the riders feet and some auxiliary equipment such as batteries therein

In accordance with another embodiment of this invention rigid members such as carbon or aluminum rods or tubes are provided to stiffen the inflatable sections or to more rigidly mechanically link (i.e. dimensionally stabilize) various plastic hull sections with other plastic hull sections.

In accordance with another embodiment of this invention a plurality of motors and propellers or impellers that are in parallel flow or in flow communication with each other are provided so that the power required from each individual motor is reduced.

In accordance with another embodiment of this invention the water flow from two or more propellers each driven by an individual motor are in flow communication with each other so as to reduce the vortex losses in the fluid system thereby increasing the energy transfer efficiency between the electric motors and the water while protecting users from touching said propellers.

In accordance with another embodiment of this invention flow straighteners are provided at the outlet to reduce or effectively eliminate vortices induced by the impellers or propellers. The flow straighteners also serve to protect the user from accidental contact with the impellers or propellers.

In accordance with another embodiment of this invention the watercraft comprises multiple individual inflation chambers that define a primary hull and a secondary hull. The secondary hull is designed to provide

sufficient buoyancy to prevent the watercraft from sinking if the primary hull is damaged. In many jurisdictions, riders are required to wear personal flotation devices. Therefore, if the secondary hull produces neutral buoyancy for the watercraft, the watercraft will only be submerged to a level at which the rider is supported by the personal flotation device if the primary hull is damaged to the point at which it provides no flotation. It will be appreciated that the secondary hull may optionally provide more than neutral buoyancy in such cases. Preferably, the secondary hull is mounted above the primary hull. Alternately, or in addition, the secondary hull comprises a plurality of chambers, preferably, outer, intermediate and inner chambers, such that damage to the outer chambers will still allow the craft to float with the rider. In the event that all chambers are compromised the craft will float

In accordance with another embodiment of this invention a cartridge filled with an expanding foam product such as polyurethane is provided. The cartridge may be engaged in an emergency to inflate some or all of the inflation chambers even if they are compromised and could no longer be filled with air so as to provide a displacement hull to keep the watercraft afloat. Alternately, the cartridge may be engaged upon delivery of the product to the site where it is to remain so as to inflate some or all of the inflation chambers with foam that will provide a displacement hull to keep the watercraft afloat even if the inflatable chambers become compromised by puncturing. Thus the watercraft can be shipped in a collapsed (e.g. folded or deflated state) and then inflated to produce a rigid structure.

In accordance with another embodiment of this invention an inner rigid chamber is provided one or more of the battery is housed, the motor unit or units are affixed, the optional manual or electric anchor is affixed, and/or which incorporates structural foam elements which allow the craft to float even if all its inflatable chambers have been compromised.

In accordance with another embodiment of this invention an emergency inflation section, which is not normally inflated, is provided and is preferably protected from damage by a rigid (e.g. hard plastic) cover. The

emergency inflation section is inflated in case of an emergency by means of a pressurized gas or foam cylinder.

In accordance with another embodiment of this invention the watercraft incorporates a small water cannon and/or electronics to allow scoring when a water jet hits a sensor on the watercraft to facilitate various games or tag and warfare simulation. Preferably, means of controlling the firing and the scoring of the watercraft water cannon games is provided.

In accordance with another embodiment of this invention a position for the mounting of fishing pole holders is provided.

In accordance with another embodiment of this invention the watercraft includes a position for a live well to allow fish caught to be kept alive by having water circulate in the holding tank with an auxiliary pump or automatically when the main motor of the craft is engaged.

In accordance with another embodiment of this invention the watercraft comprises an inflatable hull vessel that can be powered by an electric motor, an internal combustion engine, a Stirling engine, or a steam engine used to drive a propeller or impeller.

In accordance with another embodiment of this invention the watercraft includes a series of super bright LEDs to provide illumination for visibility in the day or at night with minimum power expenditure.

In accordance with another embodiment of this invention the watercraft includes a means of affixing a sun shield that may optionally incorporate solar panels to charge the battery or batteries of the unit.

In accordance with another embodiment of this invention the watercraft includes a means of mechanically and electrically connecting a fish finder and a means of mounting the associated transducer.

In accordance with another embodiment of this invention the watercraft includes an inflatable boat having a battery or an engine module which may be easily coupled and uncoupled from the boat so that the two may be separately carried to and from the launch site but which can then be

readily joined. The inflatable watercraft comprises an inflatable hull and may incorporate optional rigid hull sections having in its plan view one or more water hulls which are generally long and gently tapered outward along half to two thirds of the length which is transversely semi circular and curves upwardly toward a point at the bow. Fastened to the upper surface of the hull member are tubular inflatable members which are generally circular in cross section and which are shaped so that when joined end-to-end conform to the periphery of the water hull.

The central rigid member may be either in a mono hull, joins a catamaran design, or is in the center hull of a trimaran and provides the means of inflating and deflating the craft, stowing the craft by folding the deflated members in a prescribed manner, and houses the motor, battery and steering module and optionally provides a place for rigid or inflatable wheels to be affixed to aid transportation. The power module typically comprises a battery or series of batteries and one or more electric motor but may comprise an internal combustion engine, a Stirling engine, or a steam engine whose output shaft directly drives the propeller of impeller in the drive pod located below the boat during normal operation. When the power module comprises an internal combustion engine, a Stirling engine, or a steam engine, the exhaust gasses preferably pass through an exhaust immersed in the water to provide low temperature exhaust gasses thereby improving user safety.

In accordance with another embodiment of this invention the steering control column preferably also provides speed control, stopping, forward and reverse as well as trim controls if installed.

By providing a relatively lightweight power module readily separable from the lightweight, rigid hull, inflatable watercraft, an adult, with relative ease, can deflate the watercraft and lift the watercraft into the trunk of a car or van and place the power module separately in the trunk for transportation.

Thus a manually transportable, electric motor driven highly maneuverable personal watercraft is provided. The watercraft may be

powered by a motor up to 5 hp, preferably up to 3 hp and more preferably up to 1 hp. It may comprise a series of inflatable tubular fabric chambers and may optionally incorporate rigid, relatively thin fiberglass or other suitable plastic hull components to reinforce areas that make contact with the waterline, batteries, docks and piers, mooring lines, the rider, or anchors.

A seat is optionally provided with multiple chambers, which can optionally be inflated to allow shorter riders to be positioned so that they are tall enough and forward enough to fully operate the controls of the vessel.

The craft may also comprise a central area for placement of a battery or batteries, a pump means for inflating and/or deflating the craft, a space for stowing the deflated components of the craft, a place to affix optional rigid or inflatable wheels which help to transport the device when on shore and/or a place to mount the motor and the steering mechanism.

The electric motor of this craft drives a propeller or impeller that is housed in a safety cage that prevents accidental contact between swimmers or rocks or the lake bottom and the propeller or impeller. This safety cage may also incorporate one or more tubular sections with one or more motors per tubular section to improve the performance of the vessel while maintaining safety.

The thrust and steering system are preferably centrally located and may optionally incorporate means to trim the craft by controlling the direction of the water flow to and or from the propeller or impeller by means of a pivotally mounted horizontal member or members. Steering is accomplished either by turning the electric motor and the propeller or impeller attached thereto or by pivotally mounting a series of vertical members at the outlet of the propeller or impeller to control the direction of flow or by a combination of both of these methods which allows a very rapidly responsive steering system which allows steering with lesser turning of the controls.

A speed control and a battery level indicator are optionally incorporated on the steeling control member. The speed control may be

achieved either by turning on and off multiple motors or my using pulse width modulation to reduce the voltage delivered to the electric motor or motors or by having multiple windings on the electric motor or by varying the pitch of the propeller or impeller.

Single hull, catamaran and trimaran designs are disclosed with the ability to accommodate two or more riders on the catamaran or trimaran. An anchor can optionally be deployed from the central area and is electrically or manually raised and lowered.

The craft may optionally incorporate one or more water cannons to allow riders to play various games.

Optionally, a live well for keeping caught fish and several fishing pole holders may optionally be incorporated.

An optional lighting system is incorporated using super bright LEDs to provide excellent visibility and power conservation.

The personal watercraft may optionally be powered by a Stirling engine, steam engine or internal combustion engine driven which would occupy the space allocated for the battery and the electric motor.

Therefore, in accordance with one aspect of the instant invention, there is provided a watercraft having a hull which is adapted for travel in at least one direction of travel, the hull having front end in the direction of travel and a rear end in the direction of travel, the watercraft having at least one member for producing movement positioned below the hull, a longitudinal centre between the front end and the rear end of the hull, the at least one member for producing movement rotatably mounted to the watercraft at a rotatable mount at a single position located at or ahead of the longitudinal centre.

In one embodiment, the distance from the front end to the rotatable mount may be from about 30 to about 50% of the length of the hull.

In another embodiment, the distance from the front end to the rotatable mount may be from about 40 to about 50% of the length of the hull.

In another embodiment, the distance from the front end to the rotatable mount may be from about 51 to about 55% of the length of the hull.

In another embodiment, the watercraft further comprises a steering member having a portion to be gripped by a hand of a user and a steering rod that extends between the steering member and the member for producing movement.

In another embodiment, the steering rod extends generally vertically.

In another embodiment, the member for producing movement comprises a propeller.

In accordance with another aspect of the instant invention, there is provided a propeller housing for a watercraft comprising a body portion defining a chamber having an inlet end and an outlet end in which a propeller is positioned, the propeller and the body portion are configured to interact to cut hair that enters the chamber.

In one embodiment, the body portion comprises a longitudinally extending hollow member having an inner surface and the propeller has blades which are positioned sufficiently close to the inner surface of hollow member to create a cutting action when the propeller is in use.

In another embodiment, the body portion has a guard positioned at one end of the body portion and proximate the propeller and the propeller has blades which are positioned sufficiently close to the guard to create a cutting action when the propeller is in use.

In another embodiment, the body portion has a guard positioned adjacent at least one of the inlet and outlet ends, the guard comprises a plurality of planar members which are configured to prevent fingers and toes of a person from contacting the propeller.

In another embodiment, the body portion has a guard positioned adjacent at least one of the inlet and outlet ends, the guard comprises a

plurality of planar members which are configured to prevent fingers and toes of a person from extending past the planar members.

In accordance with another aspect of the instant invention, there is provided a propeller housing for a watercraft comprising a body portion defining a chamber having an inlet end and an outlet end in which a propeller is positioned, the body portion has a guard positioned adjacent at least one of the inlet and outlet ends, the guard comprising a plurality of planar members which are configured to prevent fingers and toes of a person from contacting the propeller.

In one embodiment, the planar members are configured to prevent fingers and toes of a person from extending past the planar members.

In accordance with another aspect of the instant invention, there is provided a propeller housing for a watercraft comprising a body portion defining a chamber having an inner wall, an inlet end and an outlet end in which a propeller is positioned, the propeller being spaced from the inner wall to define a gap, the gap having a width that is up to 25% of the diameter of the propeller.

In one embodiment, the width is from 1 to 15% of the diameter of the propeller.

In another embodiment, the width is from 3 to 10% of the diameter of the propeller.

In another embodiment, at least one of the inlet end and the outlet end of the body portion has members configured to at least partially straighten the flow of water flowing therepast.

In another embodiment, the members are planar members and each planar member has a length in the direction of flow that is from 30 to 70% of the transverse width of that planar member.

In accordance with another aspect of the instant invention, there is provided a propeller housing for a watercraft comprising a body portion defining a chamber having an inner wall, an inlet end and an outlet end in

which a propeller is positioned, at least one of the inlet end and the outlet end of the body portion has members configured to at least partially straighten the flow of water flowing therepast.

In one embodiment, the members are planar members and each planar member has a length in the direction of flow that is from 30 to 70% of the transverse width of that planar member.

In another embodiment, the members are planar members and each planar member has a length in the direction of flow that is from 40 to 60% of the transverse width of that planar member.

In another embodiment, the members are planar members and each planar member has a length in the direction of flow that is about 50% of the transverse width of that planar member.

In another embodiment, the planar members are pivotally mounted to the body portion about a horizontal axis.

In another embodiment, the planar members are pivotally mounted to the body portion about a vertical axis.

In accordance with another aspect of the instant invention, there is provided a hull for a watercraft which has a potion that is below a waterline when in use, the hull having an exterior surface and comprises a rigid hull member and at least one inflatable member wherein rigid hull member defines the portion of the hull of the watercraft that is below the waterline and the inflatable member is positioned so that at least a portion of the inflatable member is above the waterline and defines a portion of the exterior surface of the hull of the watercraft.

In one embodiment, the hull further comprises a rigid central core having a perimeter.

In another embodiment, the inflatable member extends around the perimeter of the central core.

In accordance with another aspect of the instant invention, there is provided a hull for a watercraft comprises an outer inflatable hull member and a plurality of inflatable members positioned interior to the outer inflatable hull member.

In one embodiment, the plurality of inflatable members, when inflated, proximate the shape of the outer inflatable hull member when the outer inflatable hull member is inflated.

In another embodiment, inflation of the plurality of inflatable members inflation of the outer inflatable hull member.

In accordance with another aspect of the instant invention, there is provided a driver's seat for a watercraft comprising a plurality of individually inflatable chambers.

In accordance with another aspect of the instant invention, there is provided a propulsion system for a watercraft comprising a plurality of propellers positioned in series in a longitudinally extending housing.

In one embodiment, the propulsion system further comprises a plurality of motors each of which is drivingly connected to at least one propeller.

In another embodiment, each propeller is driven by a motor.

In accordance with another aspect of the instant invention, there is provided a watercraft comprising a hull, a plurality of propellers positioned in parallel and a single steering rod rotatably connected to the watercraft and drivingly connected to the plurality of propellers.

In one embodiment, the propellers and mounted in longitudinally extending housings.

In another embodiment, the watercraft further comprises a plurality of motors each of which is drivingly connected to at least one propeller.

In another embodiment, each propeller is driven by a motor.

In accordance with another aspect of the instant invention, there is provided a watercraft comprising a hull and at least one water cannon, wherein the water canon is positioned on a side of the watercraft.

In one embodiment, the watercraft further comprises a water shield member positioned around at least a portion of the area in which an operator sits to protect the operator from water directed at the watercraft from a second watercraft having a water cannon positioned on the side of the second watercraft.

In another embodiment, the watercraft further comprises a water sensor positioned on the water shield member.

In another embodiment, the water shield member is transparent.

In another embodiment, the watercraft further comprises a water sensor.

In accordance with another aspect of the instant invention, there is provided a watercraft having a hull which is adapted for travel in at least one direction of travel, the hull having front end in the direction of travel and a rear end in the direction of travel, the watercraft having at least one member for producing movement positioned below the hull, a steering member drivingly connected to the at least one member for producing movement by a steering linkage, an a headlight provided on at least one of the steering member and the steering linkage.

In one embodiment, the headlight comprises a plurality of superbright LEDs.

In accordance with another aspect of the instant invention, there is provided a watercraft having a hull which is adapted for travel in at least one direction of travel, the hull having front end in the direction of travel and a rear end in the direction of travel, the watercraft having at least one member for producing movement positioned below the hull, a steering member drivingly connected to the at least one member for producing movement by a

steering linkage, an a radio provided on at least one of the steering member and the steering linkage.

In one embodiment, the watercraft further comprises at least one speaker.

In another embodiment, at least one speaker. Is provided on the steering member.

In accordance with another aspect of the instant invention, there is provided a hull for a watercraft which has at least one inflatable member and a canister having a mixture therein which produces a hard drying foam when the mixture is released from the canister in flow communication with the at least one inflatable member.

In one embodiment, the at least one inflatable member is adapted to be inflated by air and, if punctured once inflated, is adapted to be filled by the mixture.

In accordance with another aspect of the instant invention, there is provided a hull for a watercraft comprises a rigid hull member composed of a plurality of rigid sections which are foldably connected together and at least one inflatable member wherein rigid hull member defines at least a portion of the hull of the watercraft that is below water when in use and the inflatable member is connected to the rigid sections.

In one embodiment, the rigid hull members are foldably connected together by being connected to the at least one inflatable member.

In another embodiment, the rigid hull members are each independently connected to a different portion of the at least one inflatable member.

In another embodiment, the hull further comprises a rigid central core having a perimeter.

In another embodiment, the at least one inflatable member extends around the perimeter of the central core.

In another embodiment, the hull further comprises at least one longitudinally extending rigid members releasably connected to the hull and configured to stiffen the inflatable members.

In accordance with another aspect of the instant invention, there is provided a watercraft having a hull, at least one member for producing movement positioned below the hull, a steering member drivingly connected to the at least one member for producing movement by a steering linkage, wherein the hull has a recess for receiving the at least one member for producing movement.

In one embodiment, the at least one member for producing movement is mounted for vertical movement into and out of the recess.

In another embodiment, the linkage includes a steering rod which is vertically moveable and when the steering rod is listed vertically, the at least one member for producing movement moves into the recess.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing features and advantages of the invention will become more apparent to those skilled in the art from the following detailed description of a preferred embodiment, especially when considered in conjunction with the accompanying drawings in which like numerals in the several views refer to corresponding parts. It will also be recognized by those skilled in the art that various embodiment features may be recombined to produce a watercraft optimized to specialized applications such as fishing, hunting, general recreation, touring, etc.

Figure 1a is a left side perspective view of the watercraft made in accordance with one embodiment of the present invention.

Figure 1b is a front view of the watercraft of Figure 1a.

Figure 2a is a front view of another embodiment of the watercraft made in accordance with the present invention.

Figure 2b is a side view of the watercraft of Figure 2a.

Figure 2c is a top view of the watercraft of Figure 2a.

Figure 3 is a left side perspective view of another embodiment of the watercraft made in accordance the present invention incorporating a solar charging system, a retractable sun shade, a live well, bait storage area, and small food and drinks cooler.

Figure 4 is a rear view of the steering module of an embodiment of the watercraft incorporating many advanced features.

Figure 5a is a perspective view of another embodiment of the watercraft made in accordance with the present invention.

Figure 5b is a perspective view of another embodiment of the watercraft made in accordance with the present invention.

Figure 5c is a perspective view of another embodiment of the watercraft made in accordance with the present invention.

Figure 6a is a perspective view of another embodiment of the watercraft made in accordance with the present invention.

Figure 6b is a perspective view of another embodiment of the watercraft made in accordance with the present invention.

Figure 6c is a perspective view of another embodiment of the watercraft made in accordance with the present invention.

Figure 7 is a perspective view of another embodiment of the watercraft made in accordance with the present invention wherein an inflatable hull is affixed to sections of rigid hull.

Figure 8 is a perspective view of another embodiment of the watercraft made in accordance with the present invention wherein an inflatable hull is affixed to sections of rigid hull and carbon fiber or aluminium rods also mechanically link the rigid members.

Figure 9 is a perspective view of another embodiment of the watercraft made in accordance with the present invention wherein two batteries are contained within the hull.

Figure 10a is a perspective view of a motor and propeller module.

Figure 10b is a side view of a motor and propeller module.

Figure 10c is a front view of a motor and propeller module.

Figure 11a is a perspective view of a twin motor and twin propeller module with a single mounting shaft.

Figure 11b is a front view of a twin motor and twin propeller module with a single mounting shaft.

Figure 12a is a perspective view of a triple motor and triple propeller module with a single mounting shaft.

Figure 12b is a front view of a triple motor and triple propeller module with a single mounting shaft.

Figure 13a is a perspective view of a twin motor and twin propeller module with two mounting shafts controlled in parallel.

Figure 13b is a top view of the control linkage of figure 13a.

Figure 13c is a front view of a twin motor and twin propeller module with two mounting shafts controlled in parallel.

Figure 14a is a perspective view of a twin motor and twin propeller series module with a single mounting shaft.

Figure 14b is a side view of a twin motor and twin propeller series module with a single mounting shaft.

Figure 15a is a perspective view of a triple motor and triple propeller series module with a single mounting shaft.

Figure 15b is a side view of a triple motor and triple propeller series module with a single mounting shaft.

Figure 16a is a side view of a single motor and single propeller module with a single mounting shaft and an intake trim unit in the up position.

Figure 16b is a side view of a single motor and single propeller module with a single mounting shaft and an intake trim unit in the neutral position.

Figure 16c is a side view of a single motor and single propeller module with a single mounting shaft and an intake trim unit in the down position.

Figure 17a is a side view of a single motor and single propeller module with a single mounting shaft and an outlet trim unit in the up position.

Figure 17b is a side view of a single motor and single propeller module with a single mounting shaft and an outlet trim unit in the neutral position.

Figure 17c is a side view of a single motor and single propeller module with a single mounting shaft and an outlet trim unit in the down position.

Figure 18a is a side view of a single motor and single propeller module with a single mounting shaft and an inlet and an outlet trim unit in the up position.

Figure 18b is a side view of a single motor and single propeller module with a single mounting shaft and an inlet and an outlet trim unit in the neutral position.

Figure 18c is a side view of a single motor and single propeller module with a single mounting shaft and an inlet and an outlet trim unit in the down position.

Figure 19 shows the accelerated rudder control system.

Figure 20 (a) – (c) shows the motor being pulled up into the position to drive the watercraft to shore.

Figure 21 is a perspective view that illustrates a means of assembling the electric motors and propeller sections of the watercraft.

Figures 22(a) – (d) show the inflation and deflation steps for the watercraft in accordance with one embodiment of this invention of this invention.

DETAILED DESCRIPTION OF THE INVENTION

An embodiment of the watercraft that is the subject of the instant invention is shown in a perspective view in Figure 1a. In this embodiment, the watercraft includes a number of subassemblies, namely, the inflatable boat 1, a drive system 2, a battery 3, a seat assembly 4 and the steering and thrust control 5. Each of the construction of the inflatable boat 1, a drive system 2, the positioning of the battery 3, the construction of the seat assembly 4 and the steering and thrust control 5 may be of one or more particular designs which are detailed herein. A watercraft in accordance with the teaching herein may use one or more of these designs and each such watercraft is within the scope of this disclosure.

The boat portion 1 preferably includes a rigid hull member 6, which is preferably molded from fiberglass or other suitable plastic material, and may typically be approximately two millimeters thick. It is found that a slope angle of about 10 to 25 degrees with the horizontal expanding towards a point two-thirds towards the stern similar to the design of a kayak for the rigid hull provides excellent stability and minimized flow resistance characteristics.

As best seen in the front view Figure 1b view, the rigid hull member 6 is generally a circular arc thereby minimizing the flow resistance in the water. The water line is preferably below where the rigid portion of the hull ends so that the inflatable hull 8 does not typically contact the water 7, thus reducing the water resistance. Accordingly, while one or more inflatable hull sections may be below the waterline to provide buoyancy, these inflatable hull sections are preferably positioned interior to the rigid hull member 6. However, it will be appreciated by one skilled in the art that in another embodiment, the design of a more stable craft for children where less speed

is required would have the air-filled tubes 9 in contact with the water to provide additional buoyancy and stability.

The inflatable hull 8 preferably consists of a number of independent chambers, such as chambers 9, 10, 11, 12, 13 and 14 is typically bonded to the upper surface of the rigid hull 6 and to the central rigid core 15. These chamber 9, 10, 11, 12, 13 and 14 may be made from a multiple layers of air impermeable material such as air impermeable fabric which may include such synthetic fibers as nylon or other polyesters and laminated with rubberized material, such as NEOPRENE®, which exhibits superior air retention. The rigid hull may comprise polyester. Externally, the polyester core is preferably coated with one or more and preferably two additional layers of NEOPRENE® which provides strength and flexibility. A durable exterior coating of, e.g., HYPALON® or KELVAR® is then preferably used on the outer layer to provide abrasion resistance and ultraviolet ray protection against the combined effects of water and sun.

As seen in Figure 1b, rather than using one continuous air chamber, it has been proven expedient to construct the inflatable hull 8 from a plurality of contiguous inflatable chambers 9, 10, 11, 12, 13 and 14 in that, should one or two such chambers accidentally be punctured in use, the entire inflatable hull 8 would not become deflated. As seen in Figure 1b, the tubular segments 11 and 12 are of a larger diameter than the tubular segments 9, 10, 13 and 14, which are bonded to the rigid central support.

The rigid hull member 6 is preferably in the shape of a circular arc thereby minimizing the flow resistance in the water.

In an alternate embodiment, the outer hull member 6 may be made of an inflatable material (e.g. a material similar to that of the inflatable chambers). The inflatable chambers 9, 10, 11, 12, 13 and 14 are positioned interior to the hull member 6. Thus, when the internal inflatable chambers are inflated, the outer hull member will inflate and take on a predetermined shape. One advantage of this approach is that a double walled construction is obtained. Further, due to the smaller diameter of the internal inflatable

chambers, the required tensile strength of the material used to construct the outer hull 6 is reduced compared to the tensile strength which would be required if outer hull 6 itself was a single chamber that was inflated with a gas.

The drive system 2 of the embodiment of Figures 1(a) and (b) preferably comprises an electric motor 16 having a propeller 18. As used herein, the term propeller may be any member used to move water and may include an impeller. Preferably, to enhance safety of the watercraft, at least propeller 18, and more preferably motor 16 and propeller 18 are mounted in a housing. The housing may be of any design. Preferably the housing has a longitudinally extending body member which is hollow (e.g. tubular duct 17), an intake guard 20 and an outlet flow straightener and protective guard 19.

In accordance with one aspect of the instant invention, propeller 18 and the housing are configured to interact with each other so as to cut hair that may enter the housing. In the preferred embodiment of Figure 1(a), propeller 18 is configured to interact with one or both of guard 19 and the inner wall of duct 17 to create a cutting action when propeller 18 is in use. Accordingly, if a child is swimming near a watercraft and their hair is drawn into the chamber housing the propeller, the propeller, in conjunction with one or both of guard 19 and duct 17 will cut the hair preventing the hair from becoming entangled in propeller 18. For example, propeller 18 may be dimensioned so that the outer edges of the blades of the propeller 18 are spaced sufficiently close to the inner surface of duct 17 so that anything passing therebetween is cut. Alternately, or in addition, propeller 18 may be positioned so that the blades of the propeller 18 are spaced sufficiently close to the inner side of guard 19 so that anything passing therebetween is cut.

In accordance with another aspect of the instant invention, at least one or both of guards 19, 20 are dimensioned to prevent fingers and toes of a person from extending into the housing where they will be cut by the propeller 18. The size of the openings provided by guards 19, 20 will vary depending on the spacing between guards 19, 20 and propeller 18. If propeller 18 is adjacent a guard (e.g. guard 19 as shown in Figure 1(a), then,

in accordance with this embodiment of the invention, guard 19 is configured to prevent a finger or toe from passing into the chamber defined by duct 17. In accordance with a particularly preferred embodiment, at least one of guards 19, 20 and preferably both of guards 19, 20 comprise a plurality of planar members 162, 163 which extend in the direction of flow of fluid when the watercraft is in use. As shown in Figure 1(a) planar members 162, 163 are generally horizontally positioned. It will be appreciated that planar members will provide a safety feature is they are at any particular orientation. Further, while planar members 162, 163 are mounted at the distal ends of duct 17 and extend outwardly therefrom, they may be recessed partially or wholly in duct 17. The length of planar members 162, 163 (i.e. in the direction of flow) and the spacing between adjacent planar members is selected to prevent fingers or toes from extending to propeller 18 and, preferably, from extending past planar members 162, 163. For example, if the length of the planar members is 1inch, then the spacing between adjacent planar members is preferably up to 0.25 inches, if the length of the planar members is 2 inches, then the spacing between adjacent planar members is preferably up to 0.5 inches and, if the length of the planar members is 4 inches, then the spacing between adjacent planar members is preferably up to 0.75 inches (but sufficiently apart to permit fluid flow therebetween). Thus, the planar members define a protective grill that may be positioned at the inlet end to the chamber defined by duct 17, the outlet end of the chamber or both. Preferably, the protective grill is positioned at least at the end closest to propeller 18.

The seat assembly 4 of Figure 1(a) preferably comprises at least one and preferably a series of inflatable chambers (e.g. chambers 21, 22, 23 24, and 25) which can be optionally selectively inflated so as to position the rider for optimal comfort and in a position where they can effectively manipulate the steering and thrust control unit 5.

The steering and thrust control assembly 5 of Figures 1(a) preferably comprises includes two handles for steering 26 and 27 into which a starboard and port super bright LED 28 and 29 are preferably incorporated.

The rotation of the handle 27 preferably controls a pulse width modulation circuit or engages several motor windings to control the speed and direction of the craft. Preferably, clockwise rotation increases the forward speed from the neutral position while counter clockwise rotation from the neutral position preferably increases the backward or reverse speed of the craft. The direction of rotation of the thrust control from the neutral position controls the direction and speed of rotation of the electric motor 16 to whose output shaft the propeller 18 is mechanically affixed.

A series of super bright LEDs 30, 31, and 32 are preferably provided to illuminate the area in the direction in which the craft is being steered. The super bright LEDs 33, 34, and 35 are preferably provided to illuminate the direction in which the hull is traveling. A super bright LED 36 is preferably provided to be visible from the rear of the vessel, such as at the top of the seat assembly 4.

A pair of carry handles 40 and 41 are preferably provided for manually moving the watercraft and may be attached to the central rigid core 15 but may optionally be affixed to the inflatable hull 8 of the vessel.

A pair of water cannons 37 and 38 may be provided as a game. They may be mounted on the inflatable hull 8 or onto the central rigid core 15 and are preferably mounted on one or both lateral sides of the watercraft.

If the motor is electrically operated, then the steering and thrust control assembly may be electrically connected to the battery 3 and the drive system 2 may be rotatably mounted to the watercraft and preferably to the central rigid core 15 such as by means of a shaft 39 which extends between the steering and thrust control unit 5 and the drive system 2.

In accordance with another embodiment, the drive system is rotatable mounted to the watercraft at a position at or somewhat forward of the longitudinal centre of the watercraft (i.e. the centre between the front end and the rear end of the watercraft in a direction of travel of the watercraft). If the watercraft has the shape of a standard boat, then the watercraft has a

bow and a stern that are aligned with the direction of forward travel of the watercraft. In an alternate embodiment, the watercraft may be generally round in which case it may have more than one direction of travel. In any such case, in accordance with the instant embodiment, the drive system is rotatably mounted to the watercraft at only one location – even if the watercraft uses a plurality of propulsion units in the water. The distance from the front of the watercraft to the rotatable mount may be from about 30 to about 50% of the length of the watercraft from the front end (e.g. bow) to the rear end (e.g. stern), preferably form about 40 to about 50% and most preferably 51 to 55%. Accordingly, the point of thrust is at or ahead of the centre of the watercraft. This enhances the stability of the watercraft and also permits the watercraft to turn about an imaginary spot in the water. While in accordance with different embodiments of this invention, a plurality of motors or drive units may be used, each is preferably controlled by a single rotatable mount which is located at or slightly ahead of the longitudinal centre of the watercraft.

A hard point 42 may be mechanically affixed to the central rigid core 15 thereby providing a means of affixing a manual anchor or a towline.

In accordance with the foregoing, the resulting watercraft may have a body weighing only about 30 pounds and an engine module weighing 25 pounds and a battery weighing approximately 20 pounds. Because the three are readily separable and joinable, they can be carried as separate units. Moreover, the body portion may be readily placed atop an automobile or van. Because of the material from which the inflatable tubes are made, when placed on a car roof tube-side-down, there is no concern that the finish on the car will be damaged. The length and width of the boat portion can be designed so that it may readily be carried on the swim platform of a cruiser and usable as an auxiliary watercraft for running errands and the like when the larger craft is beached for extended periods.

Another embodiment of the watercraft, which is the subject of the instant invention, is shown in a frontal view in Figure 2a and in a side view in Figure 2b, and a top view in Figure 2c. The watercraft in Figure 2a, 2b and

2c includes a number of subassemblies, namely, the inflatable deck 43, a water hull 44, a heat engine 45 coupled to a propeller drive system 46, an auxiliary battery 47, a seat assembly 48 and the steering and thrust control 49. Each of the construction of the subassemblies may be of one or more particular designs which are detailed herein. A watercraft in accordance with the teaching herein may use one or more of these subassemblies and each such watercraft is within the scope of this disclosure.

The inflatable deck 43 is attached to the water hull 44. The inflatable deck 43 comprises a plurality of chambers (e.g. chambers 50, 51, 52 and 53) that are affixed by any means known in the art (e.g. mechanical fasteners, integral manufacturing or adhesion such as bonding or an adhesive) to the central rigid core 54. The water hull 44 is generally a circular arc thereby minimizing the flow resistance in the water. The water line is typically below where the water hull attaches to the inflatable deck. Thus, by having a hydrodynamically sound water hull 44 the shape of the inflatable hull 43 can be made to look like a spacecraft or a boat or a fictional character which might otherwise be hydrodynamically inefficient or even unsound for use as a boat.

At least one and preferably two or more water cannons 55 and 56 may be mounted on the inflatable deck and may be in flow communication with an electric pump which is switched on and off by switches on the steering and thrust control unit 49. Preferably, the water canons are mounted on one or more sides of the watercraft.

The drive system for this watercraft may comprise a heat engine 45 that is connected to a linear to rotary mechanisms 57 onto whose output shaft the propeller 58 is attached. It will be appreciated that a convention motor may be used.

The seat 48 and the LED lighting and controls may be similar to the watercraft shown in Figure 1a and 1b and are not shown in Figures 2a and 2b for simplicity.

The rotation of the handle 27 in this design controls the fuel flow rate to the heat engine thereby controlling the speed of the propeller and hence the speed of the craft. Typically, clockwise rotation increases the forward speed from the neutral position. A reversing gear engaged by a lever may optionally be installed but is not shown.

A windscreen or water shield 59 is optionally provided for the comfort and safety of the rider and to allow an optional "water" sensor 60 or plurality of sensors (not shown) to be mounted as part of a system to detect a water spray impact by a water cannon of another craft as part of a game described later. The water shield is preferably clear. The water shield preferably surrounds at least a portion of the operator when the watercraft is in use. The water shield is preferably positioned around the rear and optionally the rear and sides of the area in which the operator sits.

A canister of pressurized polyurethane foam 61 and a means to activate it 62 are optionally provided such that the foam canister is connectable in flow communication with chambers 51 and 52 such that chambers 51 and 52 (and optionally other chambers) can be filled by foam either upon delivery of the craft to the customer if a reduction in portability is acceptable or in the case of an emergency where one or more of the chambers of the inflatable hull or water hull become punctured and floatation of the vessel is inhibited.

Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view in Figure 3. The mechanical and steering arrangement of this craft is similar to the craft in Figure 1a and 1b. This embodiment incorporates a solar panel array 63 that is electrically connected to the battery of the vessel that powers the electric motor by means of wires and switches not shown. A retractable sun umbrella 66 is also optionally provided. The sun umbrella is preferably provided if the watercraft is equipped for fishing.

A pair of inflatable armrests 67 and 68, which may be comprised of a series of internal chambers (not shown), may optionally be included for the comfort of the rider.

A fishing pole holder may optionally be provided.

A means of mounting a fish finder 70 to the steering column 71 is also optionally provided and the means of electrically connecting said fish finder to the battery by means of wires and switches (not shown) is also optionally provided.

A live well 72 that is constantly filled with fresh water from a flow diverted from the pressure side of the propulsion system by means of the hose 73 may optionally be provided. Alternately, a separately controlled electric pump can fulfill this purpose. A small electrically driven air pump 74 may be provided to provide oxygen rich air to tube 75 and force said air through sparger 76 to maintain an oxygen level in the live well 72 sufficient for the fish caught to remain alive.

A small cooler 77, which may be kept cool by means of ice or by means of a refrigeration system such as a peltier effect thermoelectric module is optionally also provided and is powered by the battery 64.

A small generator 70 is also optionally provided to recharge the batteries by wires (not shown) at a rate that is insufficient to drive the propulsion system constantly at full speed. The use of a small generator is made practical by the fact that when fishing or trolling at slow speeds, the small generator provides a net charge to the battery whereas during the trip to and from the fishing locations at high speed, the energy stored in that battery provides the additional energy required by the [propulsion system but which cannot be supplied by the small generator.

A small compartment 78 for keeping bait, tackle, and other materials including an emergency kit is also optionally provided.

A preferred layout for the controls of the embodiment of the watercraft shown in Figure 1a and 1b, which is the subject of the instant

invention, is shown in Figure 4. A series of switches are provided. Switch 80 turns on and off the running lights 28, 29, 34 and 36 if this is installed in the craft. Switch 81 turns on and off the headlights 30, 31, 32, 33 and 35 if this is installed in the craft. Switch 82 fills or empties the live well 72 if this is installed in the craft. Switch 83 provides a means of raising and lowering the electric anchor if such a device is installed. Switch 84 inflates and deflates the lumbar support and the armrests if they are installed. Switch 85 turns on and off the stereo and controls its volume while switch 87 controls the radio for receiving commercial radio broadcasts and the CD player if this is installed in the craft. CDs are preferably loaded into the waterproof holder 87 and the music is heard through one or more speakers (e.g. speakers 88 and 89). As other watercraft typically employ noisy motors, a radio system is not useable hence such systems were not previously incorporated. The display of the radio is 193. The brackets 90 and 91 provide the means for mounting optional equipment such as a fish finder 176 and a power outlet compatible with most fish finders is also optionally supplied. The fuses for the vessel may be accessible behind an access panel, e.g. access panel 92. Thus, the main wiring of the vessel is contained in a small area thereby minimizing connections and making maintenance and repair easier. As this position is high above the water line, the optimal protection from water damage is provided.

Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 5a. In this embodiment the battery 94 is positioned within an inflatable hull 93 as is the rigid central section 95 and the rider sits within the hull in the space 96. The construction, assembly, and control details of this embodiment may be similar to any of the other embodiments described herein.

Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 5b. In this embodiment two batteries 97 and 98 are positioned in two separate inflatable hulls 99 and 100 and the rigid central section 101 joins these two hulls and

the rider sits on the and the rigid central section 101 and keeps his legs within the hull in the spaces 102 and 103. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 5c. In this embodiment three batteries 104, 105 and 106 are positioned in three separate inflatable hulls 107, 108 and 109 and two rigid central sections 110 and 111 join the respective hulls and the primary rider controlling the vessel sits within the hull in the space 113. Passengers may optionally occupy the hull spaces 112 and 114 or the riders may sit on rigid central sections 110 and 111. The construction, assembly, and control details of this embodiment may be similar to any of the other embodiments described herein.

Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 6a. In this embodiment the battery 115 is positioned within an inflatable water hull 116 and the rider sits on top of the inflatable hull 117 using seat 118 for comfort. The construction, assembly, and control details of this embodiment may be similar to any of the other embodiments described herein.

Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 6b. In this embodiment two batteries 119 and 120 are positioned within two separate inflatable hulls 121 and 122 and a rigid central hull section 123 joins these two hulls 121 and 122 and the rider and the passenger sit on the rigid hull section 123 using seats 124 and 125 respectively. The construction, assembly, and control details of this embodiment may be similar to any of the other embodiments described herein.

Another embodiment of the watercraft, which is the subject of the instant invention, is shown in the perspective view Figure 6c. In this embodiment three batteries 126, 127 and 128 are positioned in three separate rigid hulls reinforced with inflatable members 129, 130, and 131 and two rigid

central sections 132 and 133 join the respective hulls and the primary rider controlling the vessel sits on seat 134 while passengers may optionally occupy seats 135 and 136. The construction, assembly, and control details of this embodiment may be similar to any of the other embodiments described herein.

Figure 7 illustrates one of the means of assembling the watercraft and is the subject of another embodiment of the instant invention. The inflatable hull 137 which may comprise chambers 138, 139 and 140 is affixed (e.g. bonded) to the upper surface of the rigid hull sections 141, 142, and 143 which are arranged such that the inflatable hull will form a flexible joint between the rigid hull sections 141, 142, and 143 when the inflatable hull 137 is deflated thereby facilitating the folding of the craft for storage.

Figure 8 illustrates another means of assembling the watercraft and is the subject of another embodiment of the instant invention. The inflatable hull 144 which may comprise chambers 145, 146 and 147 is affixed (e.g. bonded) to the upper surface of the rigid hull sections 148, 149, and 150 which are arranged such that rigid elements (e.g. carbon fiber or metal rods 151 and 152) can be inserted between the inflatable hull 144 and the rigid hull sections 148, 149, and 150 to form a more rigid hull to allow for higher speed operation. In this embodiment, once the carbon fiber or metal rods 151 and 152 are removed and the inflatable hull 144 is deflated, the inflatable hull 144 will form a flexible joint between the rigid hull sections 148, 149, and 150 thereby facilitating the folding of the craft for storage.

Figure 9 illustrates another embodiment of the watercraft that is the subject of the instant invention wherein two batteries 153 and 154 are stored within the inflatable hull 155. The construction, assembly, and control details of this embodiment are similar to the other embodiments described herein.

Figures 10a and 10b are cutaways views and 10c is a front view that illustrates one of the means of assembling the electric motor and propeller section of the watercraft that is the subject of the instant invention.

The electric motor 156 is connected to a gearbox 157 onto whose output shaft the propeller 158 is mounted. The entire assembly is rotated by shaft 160 thereby changing the direction of thrust hence changing the direction of the watercraft.

In accordance with another embodiment of the instant invention, a duct 161 provides improved efficiency for the propeller 161 as do the planar members 162 and 163 which act as flow straighteners which also serve to protect the motor and propeller from damage by contact with rocks or the lake bottom as well as protecting swimmers and animals in the water from contact with the propeller. To provide improved fluid moving efficiency, the outer diameter of propeller 18 and the inner surface of duct 161 are preferably spaced close together to define a narrow gap or annular space therebetween. The width "W" (see Figure 10b) of the gap may be up to 25% of the diameter of the propeller 18, preferably from 1 to 15% and most preferably from 3 to 10%. By shaping the guard on at least the outlet end of duct 161 as a plurality of planar members, and preferably the inlet and outlet ends, the planar members act to convert the circular flow inducted in water by the rotation of propeller 18 into a linear flow. Preferably, the length L of each planar member in the direction of flow (see Figure 10(b) is about half the average transverse width W of the planar members. In a different preferred embodiment, the length L of each planar member is from 30 to 70%, more preferably from 40 to 60% and most preferably about 50% of the transverse width W of that particular planar member. Thus, if duct 161 is circular in cross section as shown in Figure 10(c), then the planar members closer to the top and bottom of duct 161 will have a shorter length. Accordingly, the length L1 of a planar member close to bottom of duct 161 is shorter than the length L2 of planar member at the middle of duct 161. It will be appreciated that while a propeller housing for a watercraft may have either a duct sized to increase efficiency or flow straighteners, the propeller housing preferably has both.

Figure 11a is a transparent view and 11b is a front view that illustrates another of the means of assembling the electric motor and propeller

section of the watercraft that is the subject of the instant invention. The electric motors 231 and 164 are connected to gearboxes 165 and 166 onto whose output shafts the propellers 167 and 168 are mounted. Two ducts 169 and 170 provide improved efficiency for the propellers 167 and 168 as do the intake flow straighteners 172 and 173 and the outlet flow straighteners 174 and 175 which all serve to protect the motors and propellers from damage by contact with rocks or the lake bottom as well as protecting swimmers and animals in the water from contact with the propellers. The entire assembly is rotated by shaft 171 thereby changing the direction of thrust hence changing the direction of the watercraft. A significant advantage of employing two or more motors is that the current required to produce the desired power is reduced proportionally to the number of motors however, as resistive losses increase as the square of the current, this leads to a significant improvement in the run time available from a given battery for a given performance level.

Figure 12a is a transparent view and 12b is a front view that illustrates another of the means of assembling the electric motor and propeller section of the watercraft that is the subject of the instant invention. The electric motors 177, 178 and 179 are connected to gearboxes 180, 181 and 182 respectively onto whose output shafts the propellers 184, 185 and 186 are mounted. Three ducts 194, 195 and 196 provide improved efficiency for the propellers 184, 185 and 186 as do the intake flow straighteners 190, 191 and 192 and the outlet flow straighteners 187, 188, and 189 which all serve to protect the motors and propellers from damage by contact with rocks or the lake bottom as well as protecting swimmers and animals in the water from contact with the propellers. The entire assembly is rotated by shaft 183 thereby changing the direction of thrust hence changing the direction of the watercraft.

Figure 13a is a perspective view, Figure 13b is a top view, and Figure 13c is a front view that illustrates another of the means of assembling the directional controls for the electric motor and propeller sections of the watercraft that is the subject of the instant invention. The electric motor,

gearbox and propeller assemblies 232 and 233 are each mounted on their own support shafts 197 and 198 to which gears 199 and 200 are mounted. The primary steering shaft 201 which is turned by the rider steering the watercraft is connected to gear 202 and the three gears 199, 200 and 202 are connected by the chain 203 such that the rotation of the steering shaft 201 by the rider causes the electric motor, gearbox and propeller assemblies 195 and 196 to rotate thereby steering the watercraft in the desired direction. It will be understood by anyone skilled in the art that this techniques may also be applied to two or motor motors.

Figure 14a is a transparent perspective view, and Figure 14b is a transparent side view that illustrates another of the means of assembling the electric motors and propeller sections of the watercraft that is the subject of the instant invention. In this embodiment, two electric motors 204 and 205 are mounted with their respective individual gearboxes 206 and 208 and respective individual propellers 207 and 209 are both mounted into a single tube 211 and share a common inlet flow straightener 212 and a common outlet flow straightener 213. The motors and propellers preferably counter rotate to improve their efficiency and optionally employ flow straighteners to further improve their efficiency and performance. A single steering shaft 210 is also employed. It will be recognized by anyone skilled in the art that that this techniques may also be applied to three or motor motors as shown in Figure 15a and Figure 15b.

Figure 16a, Figure 16b and Figure 16c are transparent side views demonstrating the concept of controlling the outlet angle to the motor, gearbox propeller assembly as a means of trimming the watercraft which is the subject of the instant invention. In each of the Figures, the electric motor is 214, the gearbox is 215, the propeller is 216, the outlet flow straightener is 220, the steering shaft is 217 and the tube 219. The trim of the vessel can be controlled by means of the rod 223, either dynamically with speed or fixed, by adjusting the angle of the outlet flow straighteners 218 which are pivotally mounted to the tube 219 about a horizontal axis thus being able to selectively

direct water upwardly or downwardly. The flow straighteners are shown in position to bring the bow of the watercraft upwards in Figure 16a, to keep the bow of the watercraft level in Figure 16b, and to bring the bow of the craft downwards in Figure 16c. Alternately, the flow straighteners may be pivotally mounted about a vertical axis thus being able to selectively direct water to the left or to the right so as to act like a rudder.

Figure 17a, Figure 17b and Figure 17c are transparent side views demonstrating the concept of controlling the angle of the intake flow straighteners 224 from the motor, gearbox propeller assembly as a means of trimming the watercraft which is the subject of the instant invention. The trim of the vessel can be controlled by means of the rod 225, either dynamically with speed or fixed, by adjusting the angle of the intake flow straighteners 224 which are pivotally mounted to the tube 226. The intake flow straighteners 224 are shown in position to bring the bow of the watercraft upwards in Figure 17a, to keep the bow of the watercraft level in Figure 17b, and to bring the bow of the craft downwards in Figure 17c.

Figure 18a, Figure 18b and Figure 18c are transparent side views demonstrating the concept of controlling the angle of the inlet and outlet flow straighteners leading to and from the motor, gearbox propeller assembly as a means of trimming the watercraft which is the subject of the instant invention. The trim of the vessel can be controlled by means of rods 227 and 229, either dynamically with speed or fixed, by coordinating the adjusting of the angle of the pivotally mounted inlet flow straighteners 228 and the pivotally mounted outlet flow straighteners 230. The flow straighteners 228 and 230 are shown in position to bring the bow of the watercraft upwards in Figure 18a, to keep the bow of the watercraft level in Figure 18b, and to bring the bow of the craft downwards in Figure 18c.

Figure 19 is a transparent perspective view that illustrates another of the means of assembling the electric motors and propeller sections of the watercraft that is the subject of the instant invention. The electric motor 234 is connected to the gearbox 235 to whose output shaft the propeller 236

is attached. This assembly is centrally mounted within a tube 237 to which the inlet flow straightener 238 and the outlet flow straightener 239 and the steering shaft 240 at attached. The steering shaft 240 is pivotally mounted within a fixed housing 241 to which the gear 242 is fixedly mounted. A rudder 243 is pivotally mounted perpendicularly to the outlet flow straightener 239 by means of a shaft 244 to whose upper terminal end a gear 245 is fixedly attached. A chain 246 connects the gears 242 and 245. When the steering shaft is rotated it will be appreciated that the rudder will effectively rotate relative to the longitudinal axis of the tube 237 such that it will effectively multiply the effective angle through which the outflow from the propeller 236 is accelerated thereby allowing a small movement of the steering shaft 240 to create a larger turning effect. This allows a craft to be readily maneuvered with less motion of the steering mechanism. It will be appreciated by anyone skilled in the art that the gear and chain may be replaced with solid connecting rods, pulleys and cables or many other mechanical means known in the art.

Figures 20a, 20b and 20c are three transparent perspective views of a watercraft constructed as per an embodiment of the instant invention. In Figure 21a the motor, gearbox, propeller and steering assembly 247 is in the normal position for high speed operation of the craft wherein assembly 247 is disposed vertically below the plane of the water hull 248. In Figure 21b the motor, gearbox, propeller and steering assembly 247 is partially retracted into the hollow cavity 249 within the water hull 248 so as to allow operation in shallower waters. In Figure 21b the motor, gearbox, propeller and steering assembly 247 is fully retracted into the hollow cavity 249 within the water hull 248 so as to allow operation right onto the beach or landing area without damage to assembly 247. This illustrates the concept of vertically translating the electric motor, gearbox and propeller assembly 247 upwards into the hollow core of the watercraft water hull 248 or higher so as to allow easy beaching or landing of the craft and to facilitate deflation and subsequent transportation. It will be recognized by anyone skilled in the art that many mechanisms including levers, pulleys, gears, telescoping columns

and other means may be employed to execute this embodiment of the instant invention.

Figure 21 is a transparent perspective view that illustrates another of the means of assembling the electric motors and propeller sections of the watercraft that is the subject of the instant invention. The electric motor 250 is connected to the gearbox 251 to whose output shaft the propeller 252 is attached. A propeller protective grill or safety cage 253 and 254 is mounted around the propeller 252 to prevent contact between the propeller and rocks or the lake bottom and to prevent contact between the propeller and fingers and toes of swimmers or marine animals. The sizing of the opening may be as taught hereinbefore. Optionally, an inlet flow straightener 257 and an outlet flow straightener 256 may be added to the assembly to enhance performance

Figures 22a, 22b, 22c and 22d are four transparent side views of a simplified version of the watercraft constructed as per the instant invention. In Figure 22a the motor, gearbox, propeller and steering assembly 247 is in the normal position for high speed operation of the craft wherein said assembly 247 is disposed vertically below the plane of the water hull 259.

In Figure 22b the motor, gearbox, propeller and steering assembly 247 is retracted into the rigid hollow cavity 260 within the water hull 259 so as to allow operation right onto the beach or landing area without damage to said assembly 258.

In Figure 22c the craft is now ashore and the watercraft water hull 259 and the seat 261 can now be deflated manually or by means of an electrical air pump which may be affixed permanently to the vessel and may also optionally inflate the vessel when unpacking it at the beach or launch area. When the craft is fully deflated, wheels 262 and 263 and their counterparts on the other side (not shown) which are rotatably affixed to the rigid hollow cavity 260 are exposed and can be used to help transport the watercraft. Preferably, wheels 262, 263 (and their unseen counterparts on the

other side) are above the water line when the water hull 259 is inflated and the craft is operated in the water. Wheels 262 and 263 (and their counterparts on the other side) make transportation of the craft to and from the water easier. The battery 264 and/or the motor and steering assembly 258 may be removed at any point. Alternately, the battery 264 and/or the motor and steering assembly 258 may remain with the rigid hollow cavity 260 in which they are mounted.

The deflated water hull 259 and deflated seat 261 can then be folded onto and/or into the hollow rigid cavity 260 to facilitate transportation (see Figure 22d). The shaft of the motor, gearbox, propeller and steering assembly 247 may optionally be rotated to make the package smaller and to act as a carry or transportation handle.

The wheels 262 and 263 (and their unseen counterparts on the other side) may optionally be inflated to become conventional wheels or to become round balls to further facilitate easy movement on sandy beaches. Said wheels may either be manually inflated and deflated or may optionally be inflated and subsequently deflated by an electric pump permanently attached to the craft not shown.

Two additional optional handles 265 and 266 are preferably exposed when the watercraft is deflated but normally sit above the water line. These handles 265 and 266 allow easy transportation of the craft.

It is to be understood that the invention can be carried out with many intercombinations of the various elements described herein and by specifically different equipment and devices, and that various modifications, both as to the equipment details and operating procedures, can be accomplished without departing from the scope of the invention itself. In particular the use of the motor assembly maybe used with a convention hull, the inflatable hull of any of the configurations may be used with any conventional motor design or any motor design discussed herein, The rigid hull may be used with any inflatable construction disclosed herein, and the inflatable seat may be used with any construction disclosed herein.